UNDERWATER FANTA'SEA'

INNOVATIVE DESIGN AND CONSTRUCTION FOR WORLD-CLASS AQUARIUM

KAJIMA
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Underwater Fanta'sea'

June 1998 marked the opening of the Long Beach Aquarium of the Pacific, a US$117 million project developed by Kajima Urban Development and built through a joint venture between Kajima Construction Services and Turner Construction. The 14,560-square-meter building contains more than 10,000 live specimens in 48 tanks filled with approximately 3.8 million liters of water. As one of the United States' premier aquariums, the facility can accommodate 10,000 visitors per day and is expected to host more than 1.8 million in its first year. At the dedication ceremony, Chairman of the Board Jim Gray remarked, "Here we are—on time and on budget—with a facility dedicated to marine conservation and that magnificent Pacific Ocean."

The Long Beach Aquarium of the Pacific follows a major urban trend in the United States: using cultural and entertainment venues to boost economic development. The aquarium is part of the Queensway Bay redevelopment effort in downtown Long Beach that includes a private retail development, a US$19.3 million park, a 610-meter-long walkway, docks for commercial fishing and tour boats, and a 1,500-space parking garage. Private revenue bonds financed the aquarium and are backed by revenue guarantees from hotel taxes and fees collected from the shipping business in the Port of Long Beach.

Aquarium attendance has already met or exceeded projections. Extended hours and other crowd control methods have been instituted to insure a positive visitor experience, and other local attractions, such as Shoreline Village, Pine Street, and the *Queen Mary,* have seen dramatic increases in visitorship.

Mayor Beverly O'Neill called the aquarium "a symbol of our bright economic future."

A 27-meter-long, 3,630-kilogram fiberglass replica of a blue whale hangs over the central Great Hall at the entrance to the exhibits. The Great Hall contains samples of species from the aquarium's three major exhibits: Southern California/Baja, the Tropical Pacific, and the Northern Pacific. Particularly dra-

LONG BEACH AQUARIUM OF THE PACIFIC

Project Type	Attraction with three major exhibit areas detailing the Pacific Ocean
Size	10,500-square-meter interior 14,560-square-meter total
Site	44,520 square meters leased by the City of Long Beach, including 17,810 square meters for parking
Visitorship	Projected at more than 1.9 million visitors per year, with a ticket cost of $13 for adults
Owner	Long Beach Aquarium of the Pacific
Development	Kajima Urban Development
Design	Hellmuth, Obata + Kassabaum Inc. and Escherick, Homsey Dodge & Davis
Construction	Joint venture between Kajima Construction Services and Turner Construction

matic is the 538,000-liter, three-story predator tank with its 400 creatures, including leopard sharks, barracudas, giant sea bass, moray eels, and yellowtail tuna. Twenty-three centimeters of acrylic window separates the visitors from the animals.

Just off the Great Hall, an underwater tunnel leads visitors into the 780,000-liter sea lion and harbor seal tank that begins the aquarium's tour of Southern California/Baja. The animals swim around the tunnel, sharing the water with divers. The end of the tunnel leads outside where the sea lions and harbor seals can be seen sunning themselves on the rocks. An adjacent tank contains dozens of stingrays, bat rays, and skates.

The Northern Pacific exhibit highlights sea life of the freezing waters of Siberia and Alaska and simulates these areas' conditions through reduced room temperature and artificial fog. Here, one can view diving birds, giant Japanese spider crabs, and the Pacific octopus. A two-tiered viewing area with a 13-meter-wide acrylic panel currently allows multiangled viewing of three young sea otters in their 159,000-liter tank.

The final exhibit area covers the tropical Pacific and the coral reefs found near the islands of Palau. Blue-spotted stingrays, golden trevallies, cardinal fish, and other species inhabit the shallow, warm water. A 1.3-million-liter tank in this area has 1,000 fish, including black tip and gray reef sharks, giant groupers, and clown triggerfish. Divers at the tropical reef put on a feeding show for visitors, starting from the bottom of the tank and working their way up to the giant sharks who swim at the top.

The Long Beach Aquarium of the Pacific was designed as a joint venture between Hellmuth, Obata + Kassabaum Inc. and Escherick, Homsey Dodge & Davis and represents the cutting edge of seismic design. The building's curves, irregular polygons, and undulating steel roof as well as its tanks up to nine meters high presented a formidable challenge to architects and engineers. The building's wet side (where the fish are housed) holds 80% of the structure's load and has a reinforced concrete system that includes curved shear walls between 41 and 61 centimeters thick. Trusses 1.2 meters in depth span the two sides of the building, creating the unique wave-like form of the roof.

The site was improved to prevent liquefaction and lateral spreading in the event of an earthquake. More than 1,800 stone columns, ranging from 11 to 26 meters deep, were used to densify the soil. A concrete mat, 71 centimeters thick, was placed on top of the stone columns to allow the building to move as a unit during a seismic event. In the end, the architects and engineers successfully mitigated seismic safety concerns while still providing an innovative design for the world-class aquarium.

More than 250,000 people had gone through the building by only its 26th day of operation and 1,000,000 by December 10, 1998. Membership now totals at least 50,000 families. The aquarium staff numbers more than 150 employees and 400 volunteers who manage and maintain a building that has already become a cultural icon in southern California.

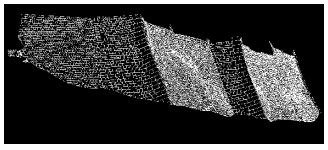
Kajima around the World

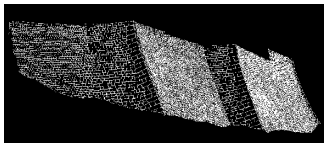
From Japan

Good Design Award for École de Hayama

In September 1998, the Japan Industrial Design Promotion Organization designated Kajima the winner of the top award in the Facility Category of the Good Design Awards (G Mark Awards) in recognition of the conceptual modernity of Kajima's design and construction work for the École de Hayama, or the Shonan Training Center of Shiseido Co., Ltd. One of 14 award fields, the Facility Category was established in 1994. A total of 54 candidates were nominated for this award.

Restoration of Stone Walls at Sendai Castle





In cooperation with the municipal government of Sendai, Kajima is using 3-D computer-aided design (CAD) technologies to faithfully restore the retaining wall surrounding Sendai Castle. Sendai Castle is a noteworthy structure well known as the former residence of Masamune Date and other historically significant figures.

The wall in question is 190 meters long and ranges from 5 to 20 meters in height. During the 400 years since the wall's construction, many of its component stones were dislocated by earthquakes, the vibration of motor vehicles, the growth of trees, and so on. The displaced stones had been left as they were, and there was a growing danger that the entire wall might collapse. The component stones are square-cut, each averaging one ton in weight, and were cut to fit together perfectly. Because of this precision cutting, the wall cannot be restored unless the stones are replaced in their original positions, but no record is currently available.

Accordingly, before disassembling the wall, Kajima measured and input data on the dimensions of the facing surfaces of approximately 10,000 stones. This data was used to create a high-precision simulation of the wall's original appearance. This simulation is effectively guiding specialized architects in their efforts to restore the wall, and the restoration project is scheduled to be completed in 2001.

From Singapore

New URA Head Office Building Completed

The new head office for the Singapore government's Urban Redevelopment Authority (URA) was completed in September 1998 after more than two years of construction by Kajima Overseas Asia Pte. Ltd. (K.O.A.) This new building is conveniently located in the middle of the central business district of Singapore.

K.O.A. and Kajima Design Asia Pte. Ltd. were contracted for this project on a design, development, and build basis. The building's conceptual design was done by the URA itself, and Kenzo Tange Associates was involved as a design consultant. It consists of 2 underground stories, 16 stories of offices, and 5 stories of podium block. There is an observatory with floor-to-ceiling glass windows at the top of the office block. The total floor area amounts to 45,372 square meters.

The URA is Singapore's national planning authority and statutory board under the Ministry of National Development. This ministry is responsible for Singapore's physical development through long-term land-use planning, public housing, public works, urban redevelopment, parks and recreation, as well as other aspects of the physical development of Singapore.

From Germany

Topping-Out Ceremony for the Sony Center Pottsdam Square Project in Berlin

Plans to transfer Germany's capital functions to Berlin in 2000 have spurred an unprecedented building boom, and among the largest of the construction projects now under way in Berlin is the Sony Center Pottsdam Square Project. On September 2, 1998, the mayor of Berlin and approximately 1,000 other people attended the topping-out ceremony. Kajima was represented at the ceremony by a delegation headed by Director and Senior Advisor Shoichi Kajima and Managing Director Naoki Atsumi, while Sony was represented by its entire board, including Chairman Norio Ohga and President Nobuyuki Idei. Sony, Kajima, and a leading U.S.-based developer, Tishman & Speyer Properties, have invested in the project, which will create 160,000 square meters of floor space for offices, apartments, and other uses. In addition to offices and apartments, the project will feature an IMAX 3-D theater and premium restaurants. When it opens in spring 2000, the project is expected to become a high-profile symbol of Germany's new capital.

From North America

Upgrading and Expanding Auto Plants

Kajima U.S.A. Inc. has recently completed three projects with a total budget of approximately US$35 million for the Saturn Corporation in Spring Hill, Tennessee. The first construction work Kajima U.S.A. has ever undertaken for a U.S. automaker, the projects involved the construction of a fire wall in the existing Body Shop and the expansion of Saturn's Vehicle Interior Systems Facility and Body Systems Facility. Special care was taken to avoid disrupting production by coordinating construction and manufacturing operations. All the projects were completed on or ahead of schedule, and Kajima received an award from Saturn for its performance.

In February 1998, Kajima de Mexico was awarded a design and build contract to expand the General Motors facility in Silao, Mexico. This facility produces the Chevrolet Suburban, which is distributed in Mexico and exported to other countries throughout the Americas. The US$25 million expansion project involved substantial additions to the existing Paint and Body shops as well as smaller additions to the General Assembly portion of the plant. Kajima was also responsible for doubling the size of incoming gas service and distribution throughout the facility. Scheduled to be completed in early 1999, the project has provided Kajima de Mexico with valuable experience.

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